FLYING EYE

Matrice 4 Flysafe C5

FTS + Parachute + Optional geofencing + Optional speed limiter (EASA C5 certification)

5

User manual

Made in France

FLYING EYE

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About us

Flying Eye has been your specialist drone-technology partner since 2009. We have been developing kill-switch and parachute systems since the introduction of drone regulations in 2012. With its pyrotechnic system derived from aviation technology, you benefit from the most efficient and lightest system on the market.

We remain at your disposal for any technical or commercial information.

www.flyingeye.fr

Green Side 1B, 400 Av. RoumanilleBiot - Sophia Antipolis 06410

09 72 62 78 50

info@flyingeye.fr

Before handling the Flysafe system, carefully read this manual.

Warnings and precautions

Flying Eye reserves the right to suspend the warranty for anyone who fails to comply with the basic safety instructions set out below.

Flying Eye disclaims any liability for damage or injury directly or indirectly related to the use of pyrotechnic cartridges, or resulting from the use of pyrotechnic cartridges that do not meet safety requirements and standards.

The FlySafe kit is designed for a standard configuration, without accessories or additional payloads. Any flight performed with accessories is carried out under the user's sole responsibility; Flying Eye disclaims any liability in the event of an incident, damage, or non-compliance related to such use.

Any handling other than the operations described in the manual is prohibited. The device must be used only by (or under the supervision of) a responsible adult. Always keep the device out of reach of children.

Do not place the device in a damp or wet environment and keep it away from UV exposure.

Do not expose the system to low or high temperatures, significant vibrations, impacts, contact with chemicals or acids, or long-term storage in an environment with high humidity or dust.

Improper use may cause the pyrotechnic cartridges to explode and put you in danger. The maximum operating temperature is 40°C and the minimum operating temperature is -15°C.

Warnings and precautions

The proper condition of the parachute system must be checked before each use. Do not use the device if it is damaged or if the test procedure is unsuccessful. If this is the case, contact your reseller.

The parachute does not affect the drone's operation in any way.

Any drone flight involves a risk to equipment and to people nearby, with or without a parachute. The use of a parachute must never increase your risk-taking.

The parachute must be deployed manually by the user. Regular training is necessary to react properly in an emergency. For the safety of the equipment and third parties, regularly perform simulated ground deployments using the Test LEDs.

The ejection system works only once. Once used, the pod containing the parachute and the charge must be replaced before any further use.

Technical description

Description

- System enabling EASA C5 classification
- Manually and automatically deployable parachute
- The kill-switch module is installed inside the drone
- Compatible with DJI Matrice 4E and 4T
- MoC2511 Declaration of Compliance
- C5 Declaration of Compliance
- Optional geofencing
- Optional speed limiter

Installation is carried out in our workshop (installation included in the price).

Even if drones are used and maintained correctly, they can sometimes encounter severe weather conditions or issues such as GPS signal loss, a technical motor failure, or a remote controller malfunction.

In this type of critical and emergency situation, it is crucial to have immediate activation of a safety device.

Technical description

Parachute backup systems with automatic fall detection can make the difference compared to human reflexes. The Flying Eye parachute kit can be deployed automatically in these situations, ensuring the safety of your drone and, above all, reducing ground impact to protect third parties.

Technical specifications

Weight	209g (+/- 3g)
Range	2500 m
Activation	• Manual deployment by double simultaneous press • Automatic deployment via fall detection • Automatic deployment in case of exiting the flight zone (optional geofencing) • Automatic deployment in case of overspeed (optional speed limiter)
Battery life	More than 30 hours for the remote controller (rechargeable 1800 mAh Li-Po battery via USB-C).
Remote controller	Automatic power-off after 30 minutes without a connection Secure power on/off (short press then long press)
Communication	Bidirectional link, FTS transmission frequency: 868 MHz Encrypted (256-bit) and authenticated frames
Security	Power supply redundancy of the Flysafe kit
Maximum impact energy	No wind: 18 J Maximum wind (43 km/h): 120 J

Equipment

Included

Flysafe remote controller

Remote controller screws

Parachute pod

FTS module

Module mount

Test LED

Screws (4 countersunk and 2 round-head)

C5 Declaration of Compliance

Not included

Drone

Remote controller

Screwdriver

Using the remote controller with this system is easier with a harness.

Installation

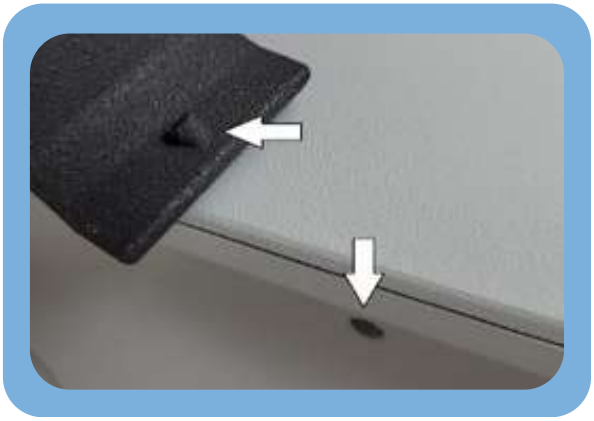
Have the Flysafe remote controller, the drone remote controller, and the screws ready.

Attach the Flysafe remote controller to the drone remote controller using the screw holder.

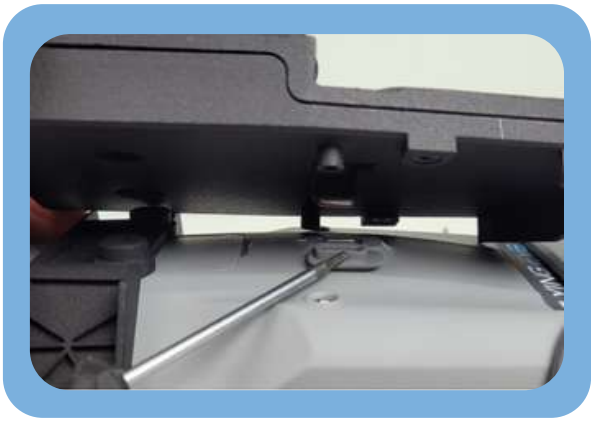
Remove the USB-C cover.

Install the mount on the drone.

Installation



Clip it into the holes on the sides using the mount tabs.



Place the module on the mount and connect it to the USB-C port.

Place the countersunk screws at the front and the round-head screws at the rear, then tighten.

Installation

Insert the parachute into its slot.

Connect it fully into the USB-C port.

Tighten the side screws to ensure the parachute is securely held in place.

The parachute system is now installed.

⚠ Caution when inserting the pod: inserting the parachute the wrong way may damage the connectors and impair system operation.

Operating instructions

01 CHARGING

The parachute pod charged automatically when it is installed on the drone and the drone is powered on.

02 START-UP

Before switching on the kill-switch/parachute system, align the unit horizontally:

- Power-on: The Matrice 4 parachute pod powers on automatically when the drone powers on, provided it is correctly inserted. An audible signal confirms that the pod has powered on properly.

Operating instructions

03 STOP

The parachute pod shuts down automatically when the drone is powered off.

04 PARACHUTE DEPLOYED

The red LED remains on and the buzzer sounds every ten seconds (remaining power must be above 20%).
Turn off the buzzer once you have recovered the drone.

Operating instructions

Pod ON

+

Flysafe remote controller OFF

Automatic deployment only

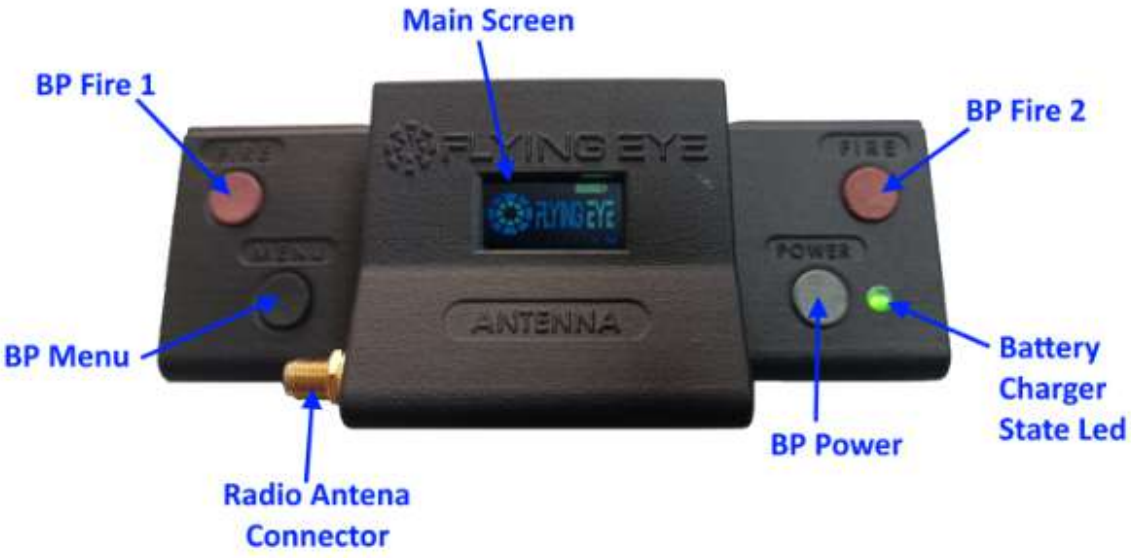
Pod ON

+

Flysafe remote controller ON

Automatic & manual deployment

Flysafe remote controller



START-UP AND SHUTDOWN

To switch the Flysafe remote controller on or off, press the power button (grey) with a short press, then a long press.
The battery level is displayed on the screen.

DEPLOYMENT

Parachute deployment is triggered by pressing both “FIRE” buttons (red) simultaneously.

USB TRANSFER MODE

To power on the Flysafe remote controller in USB transfer mode, connect it to a computer and switch it on while holding the menu button. To exit USB mode, restart the remote controller.

Flysafe remote controller

The main display provides telemetry feedback from the receiver and continuously indicates its status. It is divided into four distinct sections:

- The strength of the radio link with the receiver
- The remote controller battery level
- The status of the FTS system on board the aircraft (detailed in the next section)
- The status of the geofencing system on board the receiver (detailed in the next section)

Flysafe remote controller

FTS status

The FTS status (i.e., the cut-off system) is displayed on the left side of the main screen. The following icons may be shown and correspond to a specific status:

The cut-off system is fully operational. The user can trigger a manual cut-off.

The system has been cut off, either manually by the user or by the geofencing system.

The radio link with the receiver is lost. The drone is powered off or out of range.

The pyrotechnic charges are not connected. Please check the parachute installation.

The pyrotechnic charges are damaged; please contact your reseller.

Flysafe remote controller

(Optional)

Geofence status

Note: Geofencing features are available only as an option. If not installed, the manual mode icon will always be displayed.

The geofencing status is displayed on the right side of the main screen. The following icons may be shown and correspond to a specific status:

Manual mode only (geofencing not available)

Fence loading or verification in progress; this may take some time for large fences.

Geofence system initialization

Searching for a sufficient GPS signal

Geofence enabled and the drone is inside the fence.

Geofence enabled and the drone is inside a warning zone.

Drone outside the fence; flight termination in 0.2 s.

Using the geofence

(Optional)

Start-up procedure

To ensure proper geofencing operation, it is essential to follow this order: the remote controller must be switched on first to activate the fence. Then the drone can be powered on, which will either load a new fence or verify that the fence stored in the receiver matches the one on the remote controller.
Once the fence is validated, the GPS signal acquired, and the icon confirming that the drone is inside the zone appears on the screen, takeoff can be performed and the mission carried out safely.

Fence update

- Create your own fence using the editing tool.
- Save the fence under the name “fences.json”.
- Connect the remote controller via USB and start it in USB transfer mode.
- Copy the fences.json fence file to the root directory (make sure to keep the exact file name).
- Restart the remote controller (normal mode).
- Restart the aircraft and wait for the fence to load.
- Once loaded, the geofence status confirms activation.
- The user can proceed with the flight.

Note: If the fence is not valid (incorrect structure or format; see the next section), the system will automatically switch to manual mode. You must then correct the fence using the tool.

Editing a geofence

(Optional)

User access

Access the GeoFence Editor:

https://geofence-editor.flyingeye.fr/

Log in using the credentials you received beforehand.

Choose a new password and change it by clicking “Settings”:

Review the interface and explore the different features.

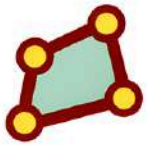
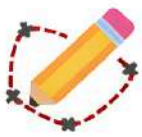
Editing a geofence

(Optional)

Creating your flight zone

The editing procedure is as follows:

- Search for your operation location using the search engine.
- Draw the main fence and validate it.
- Draw the warning fence and validate it.
- Add the No Fly Zones (NFZs) and validate them (optional step).
- Add the warning NFZs and validate them (optional step).

	**Search tool:** The search function allows the user to easily find a specific location by entering the name of a city or an address. A dialog box appears in which the user can type the name in a text field and confirm by clicking the "Search" button.
	**Main Fence editing:** Allows drawing the **Fence** polygon (orange with a red outline). Click once to enter edit mode; the user clicks on the map to draw, then validates the outline by selecting the first point – either by clicking this button again.
	**Warning Fence editing:** Allows drawing the **warning** polygon associated with the Fence (green with an orange outline).
	**No Fly Zone (NFZ) editing:** Allows drawing NFZ polygons (red with a red outline).
	**Warning NFZ editing:** Allows drawing **Warning** polygons associated with NFZs (orange).
	**Polygon edit mode:** Switches to polygon edit mode. Allows the user to correct polygons already drawn, and to add and/or

Geofence editing

(Optional)

	**Deletion of polygons.** Allows the user to delete a targeted polygon.
	**Backup.** Allows saving the current Fence in json format expected by the Standalone remote control (geosjon standard with extended properties).
	**Loading of Fence.** Allows the user to reload a fence they previously edited.
	**Cleanup. Allows.** Alllows the user to reload a fence they previously edited.
	Cleanup. Allows the user to delete all fences currently being edited (resetting editing progress).

The criteria for invalidating a fence relate to the integrity of each element. There can be only one fence associated with one warning fence. By definition, each fence perimeter drawn must be a simple, non-self-intersecting, closed polygon. Likewise, there can be a maximum of five NFZs associated with up to five Warning NFZs. A warning fence must be defined inside the main fence, and similarly, a Warning NFZ must be defined outside its associated NFZ.

It is the user's responsibility to define a valid fence and ensure it is properly loaded. Likewise, the user must make sure to take off from within the active fence; otherwise, the geofence will not be enabled at startup and will only activate once the drone enters the fence.

Example of a complete, valid fence with NFZs.

Pre-flight test

Before the first flight of the day at a given operation site, check all components of the system and verify its integrity. If any anomaly is detected, do not proceed with the flight and contact your reseller.

Ground functional test:

1	Ensure that the entire drone system is powered off: battery disconnected and automatic module stopped.
2	Remove the parachute pod.
3	Insert the test LED in place of the parachute pod.
4	Install the battery.
5	Power on both remote controllers and the drone.
6	Start the drone motors.
7	Trigger the Flysafe system by pressing both red “FIRE” buttons: the four motors stop and the test LED lights up.
8	Power off the drone and both remote controllers.
10	Reinstall the parachute pod (as described on page 12).

Important: Remember to re-tighten the two screws.

Flight preparation

Simplified checklist for flight preparation in specific categories:

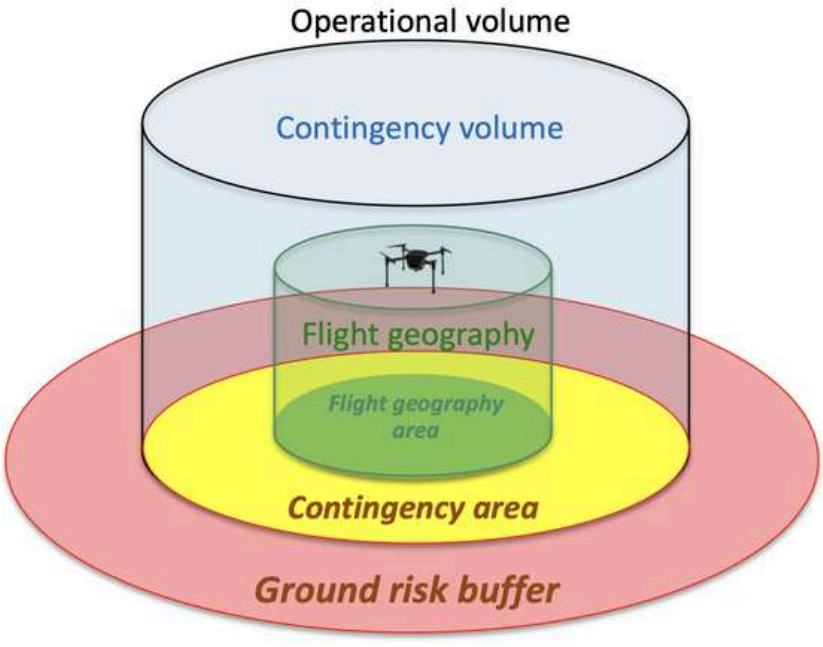
Volumes, limits, and zones to be defined for your operations when using automatic FTS:

Flight Geography: Programmed flight volume for automatic flights or the planned volume for trajectories in manual mode.

Contingency Volume: Flight volume within which contingency procedures can be initiated to return to the programmed or planned flight zone.

Contingency Volume Limit: If this limit is exceeded, emergency procedures must be triggered. This is notably the case for the Flying Eye Flysafe automatic FTS.

Ground Risk Buffer: Ground-projected area where no third parties must be present in the event of an aircraft crash, also referred to as the Third-Party Exclusion Zone (ZET).



Operational conditions

Minimum altitude (for optimal parachute effectiveness): 15 m
Maximum transmission range: 2,500 m (flat, open terrain with no interference)
Maximum wind speed: 43 km/h
Parachute opening time: 1.5 s
Descent speed under parachute: 5 m/s
Operating temperature: -10 to 40 °C
Impact energy without wind: 18 J

Frequency used: 868 MHz

LoRa 868 MHz is shared with other users and devices operating in the same frequency band, such as home automation remote controls, power networks (Linky), home IoT networks, industrial communication systems, etc. These devices may interfere with the FTS system, causing disturbances in transmissions between the remote controller and the receiver, resulting in transmission delays, data loss, or even complete communication interruptions.
It is therefore necessary to check the signal strength before the flight and to monitor it throughout the flight.
It is also necessary to avoid flying near high-power radio frequency emission sources or electrical installations.

Operational conditions

	Automatic	Manual
Minimum altitude	3 m	10 m
Maximum altitude	120 m	

STS-01 scenario:

Ground Risk Buffer size:

	Minimum distance to cover by the buffer zone for preventing ground risks for unmanned aircraft without onboard crew	
Maximum height above ground	**of an MTOM less than or equal to 10 kg**	**of an MTOM greater than 10 kg**
	of an MTOM less than or equal to 10 kg	of an MTOM greater than 10 kg
30 m	10 m	20 m
60 m	15 m	30 m
90 m	20 m	45 m
120 m	25 m	60 m

Operating authorization

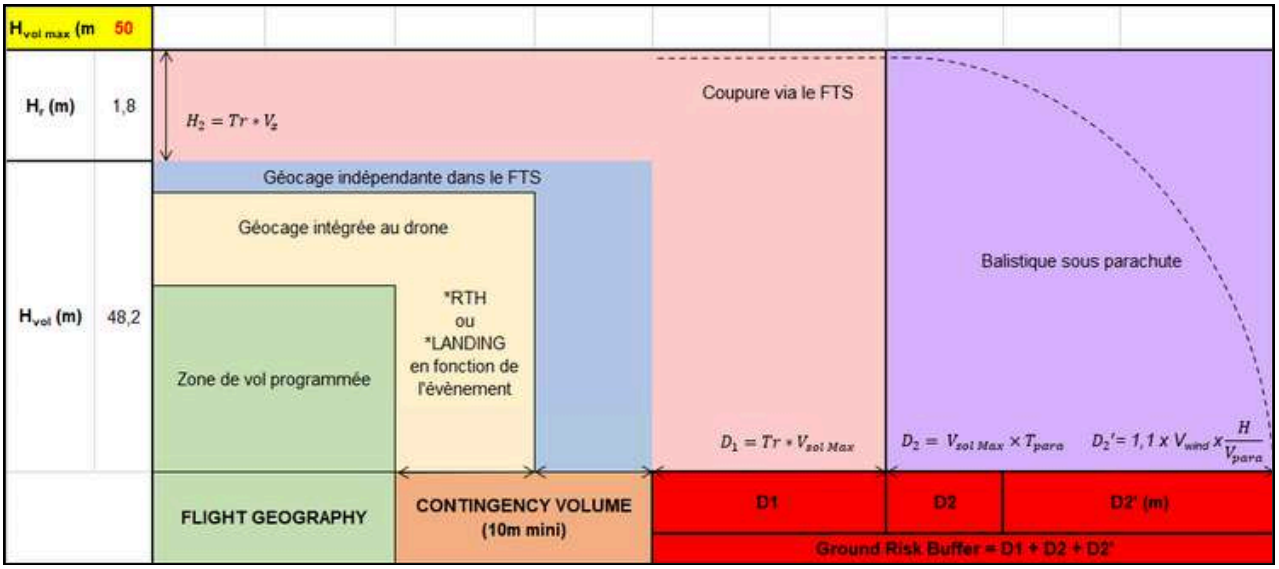
General information:

The Flysafe system allows for different operating modes:

- Manual deployment allows the pilot to shut down the drone if necessary, such as in the event of a fly-away. In this case, a pilot reaction time of Tr = 3 s is assumed.
- Automatic deployment automatically stops the drone in the event of a fly-away, with a shorter reaction time of Tr = 0.3 s, which helps reduce the size of the Ground Risk Buffer (GRB).
- Speed limiter shuts down the drone in the event of overspeed. This limits the drone's maximum speed and further reduces the size of the GRB.

Operating authorization

Ground Risk Buffer (with parachute): determination / calculation



Buffer sizes based on flight altitude when using the FTS Flying eye in automatic mode			
Operating volume altitude (m)	Corresponding Ground Risk Buffer(m)		
	Manual Deployment	Automatic Deployment	Auto + Speed Limiter of 10m/s
10	112	61	45
20	139	87	71
30	165	114	98
40	192	140	124
50	218	167	151
60	244	193	177
70	271	219	203
80	297	246	272
90	324	272	256
100	350	299	282
110	376	325	309
120	403	352	335
130	429	378	362
140	456	404	388
150	482	431	414

Maximum vertical speed: Vz = 6 m/s

Reaction time:

- Automatic Tr = 0.3 s
- Manual Tr = 3 s

Maximum drone speed:

- Vmax = 19 m/s
- Speed limiter: Vmax to be defined with Flying Eye

Deployment time:

- Tpara = 1.5 s

Descent speed:

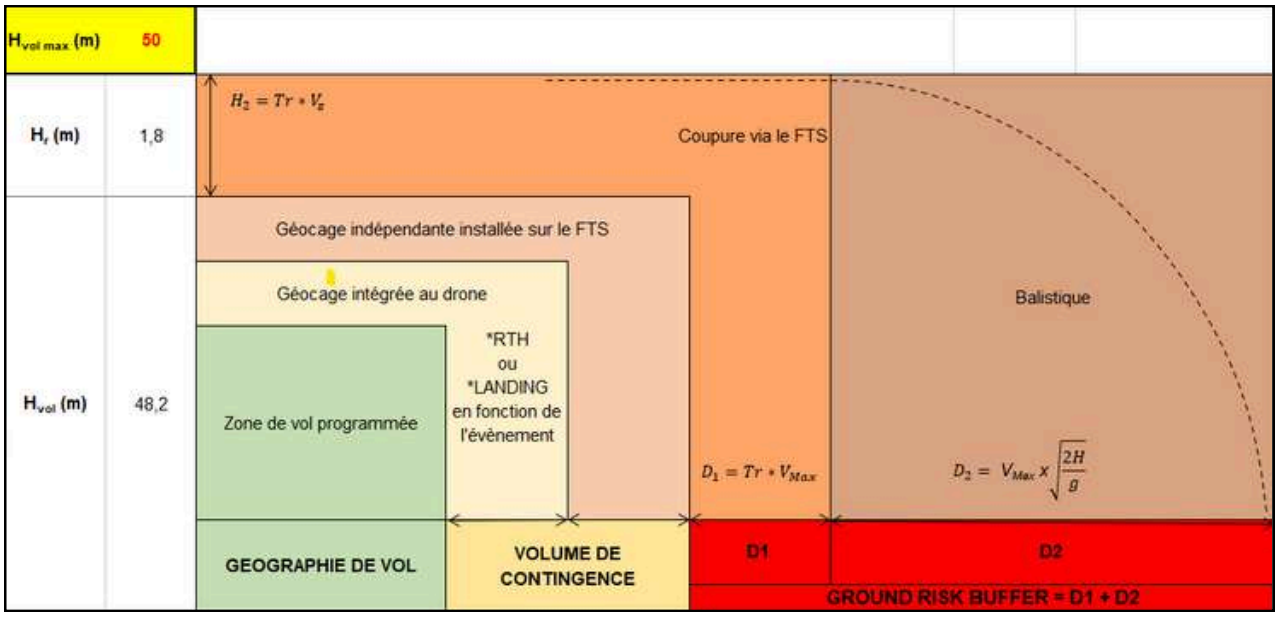
- Vpara = 5 m/s

Wind speed: Vwind = 12 m/s
(can be reduced by the operator)

This method is provided as an example. The operator can refine the GRB calculation by referring to Annex 1 of the SORA Implementation Guide.

Operating authorization

Ground Risk Buffer determination (without parachute)



Buffer sizes based on flight altitude when using the FTS Flying eye

Operating volume altitude (m)	Corresponding Ground Risk Buffer(m)		
	Manual Deployment	Automatic Deployment	Auto + Speed Limiter of 10m/s
10	85	33	18
20	96	45	24
30	104	53	28
40	104	53	28
50	112	67	35
60	124	73	35
70	129	78	41
80	139	88	46
90	133	82	48
110	147	96	51
120	151	94	57
150	163	111	59

Maximum vertical speed: Vz = 6 m/s

Reaction time:

- Automatic Tr = 0.3 s
- Manual Tr = 3 s
-

Maximum drone speed:

- Vmax = 19 m/s
- Speed limiter: Vmax to be defined with Flying Eye
-

Gravitational acceleration: g = 9.81

This method is provided as an example. The operator can refine the GRB calculation by referring to Annex 1 of the SORA Implementation Guide.

Operating authorization

Operating procedures / Use procedures

Procedure to follow		
MANUAL FTS		
Context	**VLOS**	**BVLOS**
Loss of the FTS radio link	RTH	
Unable to keep the drone within the planned flight limits	Flight interruption by triggering the FTS	
Loss of position information, or doubt about its validity	Immediate landing	Flight interruption by triggering the FTS
AUTOMATIC FTS		
Loss of the FTS radio link	RTH	
Loss of GPS signal on the FTS	RTH	
Loss of GPS signal on the drone and the FTS	Immediate landing	Flight interruption by triggering the FTS

Maintenance

Maintenance after each deployment
Replacement of the pyrotechnic charges. Replacement of the parachute pods. Return the used pods to Flying Eye.

Drone tracking
At the end of each flight day, the operator completes the provided flight tracking file (see Appendix 1) or any other tracking tool. In the event of a malfunction, the operator fills out the "incident report" (see Appendix 2) and sends it to Flying Eye.

Maintenance after 1,000 deployments (including the pre-flight test)
After 1,000 deployments of the Flysafe system, the drone must be sent to our facilities for inspection.

Cleaning
Clean the accessory kit using a damp cloth. Do not use chemical products. Do not use a high-pressure washer.

Update
When using the drone with reinforced containment, please check the compatibility of the versions of the different components before updating them. Compatible versions are listed in the release note available at the following address:

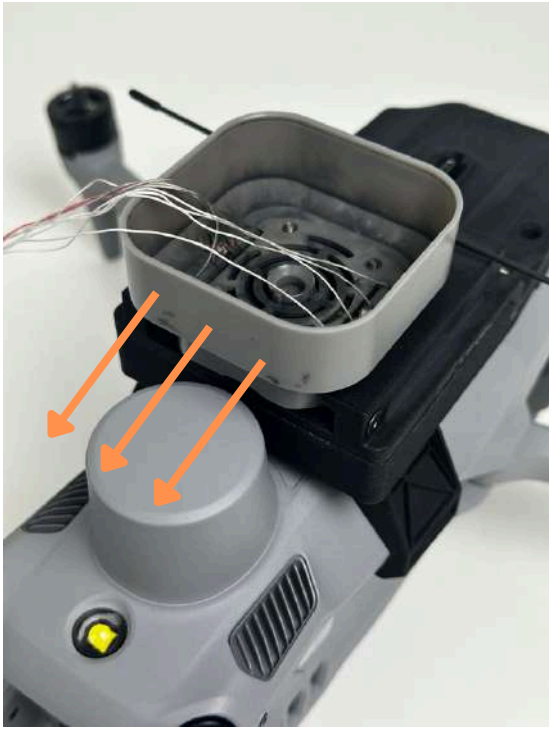
Parachute pod replacement

Steps to replace the parachute pod:

Order a new parachute pod (grey housing).

- Unscrew the two screws located under the pod (one on each side).

Parachute pod replacement



- Slide the pod toward the rear of the drone.

- The parachute mount will then be released.

Parachute pod replacement

- Insert the new parachute pod by sliding it toward the front of the drone, making sure the USB-C port is also facing the front of the drone.

- Tighten the two screws located under the pod on each side of the mount.
- Your pod is now correctly installed and ready to be used again.

Support and Warranty

Technical Support

If you encounter any difficulties during installation or have additional questions about using the Flysafe kit, please contact Flying Eye's technical support.

Warranty

The Flysafe kit for DJI Matrice 4 comes with a 12-month warranty under the purchase terms and conditions. The warranty covers manufacturing defects but does not apply in the event of damage caused by improper installation, an accident, or incorrect use.

Tracking tool (Appendix 1)

FLIGHT LOG

Date (yyyy/mm/dd)	Nature of Flight	Duration (min)	Phone	Location	Average Wind Speed (m/s)	Chute/FTS Monitoring			Remarks	Year for Annual Review
						FTS Activation	Activation Error	Involuntary FTS Activation		

Incident report (Appendix 2)

FLYING EYE PARACHUTE · ELECTRONICS · DETECTION	PARACHUTE SYSTEM TRACKING REPORT	Version : 01 Date of aplication: 23/06/2023

PARACHUTE SYSTEM TRACKING REPORT

1. UAS Identification	
Date	
Drone s serial number	
Report number	
Number of flight hours	

2. Cut-off activation failure during pre-flight tests
Number of UAS flight hours

3. Cut-off activation failure during flight		
Number of UAS flight hours		
Remote control / drone cut-off distance		
Operation location		
High power transmitter present in the operational area	YES	NO

4. Cut-off activattion during flight		
Number of UAS flight hours		
Commanded activation	YES	NO
Remote control / drone cut-off distance		
High power transmitter present in the operational area	YES	NO

4. Cut-off activation during flight		
Number of UAS flight hours		
Activation commanded	YES	NO
Remote control / drone cut-off distance		
High power transmitter present in the operational area	YES	NO

You will find all detailed information on how to operate the aircraft in the manual available for download on this page:

https://dl.djicdn.com/downloads/DJI_Matrice_4_Series/DJI_Matrice_4_Series_User_Manual-fr.pdf

FLYING EYE

WWW.FLYINGEYE.FR

INFO@FLYINGEYE.FR

09.72.62.78.50

400 AVENUE ROUMANILLE
GREEN SIDE - BATIMENT 1B
06410 BIOT / SOPHIA ANTIPOLIS